Preliminary Results of 1:3 Million Geological Mapping of the Mercury Quadrangle H-10 (Derain)

Conference or Workshop Item

PRELIMINARY RESULTS OF 1:3 MILLON GEOLOGICAL MAPPING OF THE MERCURY QUADRANGLE H-10 (DERAIN). C. C. Malliband[1], D. A. Rothery[1], M. R. Balme[1] and S. J. Conway[2] [1]School of Physical Sciences, The Open University, Milton Keynes, MK7 6AA, UK. (chris.malliband@open.ac.uk). [2]LPG Nantes–UMR CNRS 6112, Université de Nantes, France.

Introduction: MESSENGER heralded a new era in our geological understanding of Mercury as a dynamic planet. Geological mapping of surface features is essential in understanding both local and global geology. To this end, we have started mapping the H-10 (Derain) quadrangle to publish at 1:3 million scale to the same standards as other new MESSENGER mapping [1,2,3,4,5,]. This will allow integration into a global geological map [6]. H-10 quadrangle is in the equatorial band of Mercury, located between 0°–72°E and 22N°–22°S (Fig. 1). It was not imaged by Mariner 10; therefore this MESSENGER-based work is the first high resolution geological mapping of the quadrangle. Here we present initial observations from the first stages of mapping.

Mapping: We are conducting our mapping principally using the MDIS (Mercury Dual Imaging System) 166 m/pixel mosaic. Features of interest will be examined in detail using individual MDIS NAC (Narrow Angle Camera) images, which provide better resolution, as well as alternate illumination angles. We are using other MESSENGER datasets, such as the global DEM [7] and the 'enhanced colour' products [8], to complement the MDIS mosaic and NAC images. Limited elevation data from the MLA (Mercury Laser Altimeter) are also available. We are creating linework at a scale of 1:300 000. The map is a Mercator projection, using the GCS 2010 datum.

Ancient Basins: H-10 contains two highly degraded basins identified by [9] and listed by them as B30 and B36.

B30 – Basin B30 has distinct topographic relief (Fig. 2), but is indistinct on images and therefore is probably pre-Tolstojan in age. Its diameter is 1390 km [9], making it the second largest basin on Mercury. The SE basin edge is marked by a lobate scarp. This has a westward vergence, outwards from the basin. However, at the northern end of the lobate scarp system, there is a closely associated system with the opposite sense of vergence. We will examine the rest of the basin boundary to seek evidence of other tectonism.

B36 – B36 is a 730 km diameter ancient basin and is shown in Fig. 3. B36 is much more obvious on the MDIS mosaic than B30. Although its eastern rim is superposed by ejecta from several Calorian-Tolstojan peak-ring basins, its western rim is arguably clear enough to justify a Calorian age, and can be no older than Tolstojan in age. We are still working on the de-

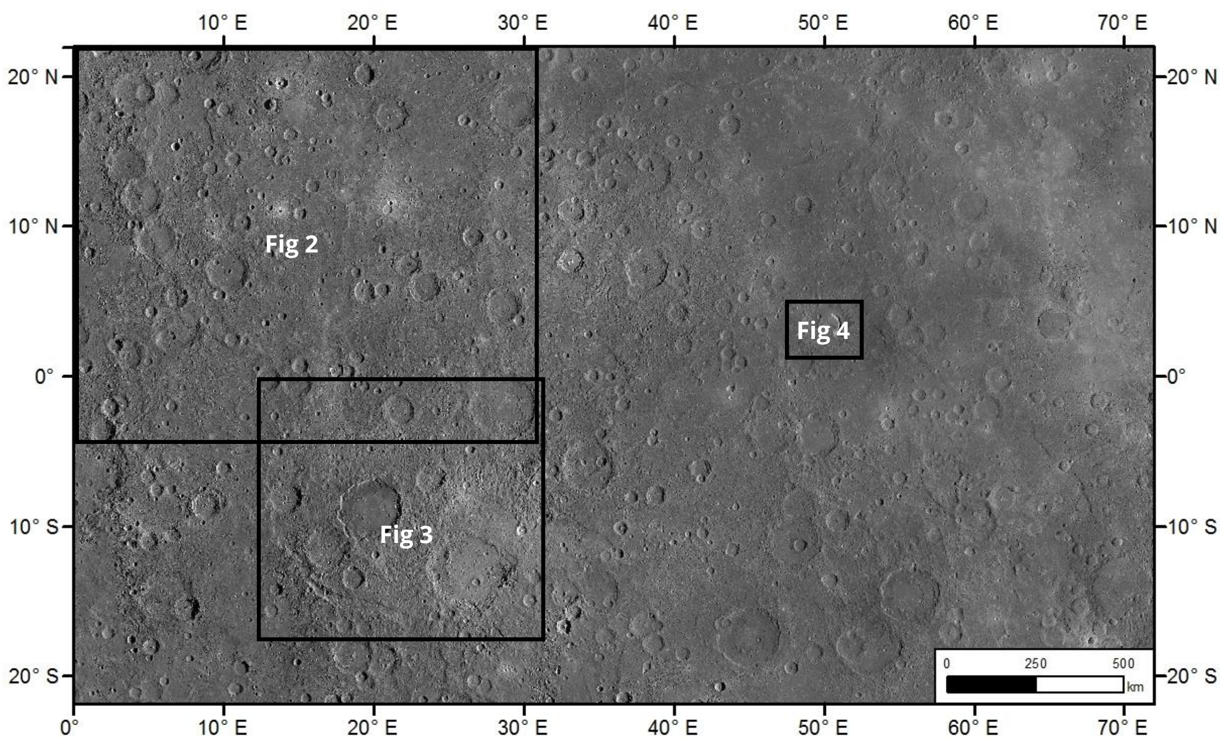

Figure 1 *- Quadrangle H-10 (Derain). Locations of Figures 2, 3 and 4 are shown. Basemap is MESSENGER 166m mosaic.*

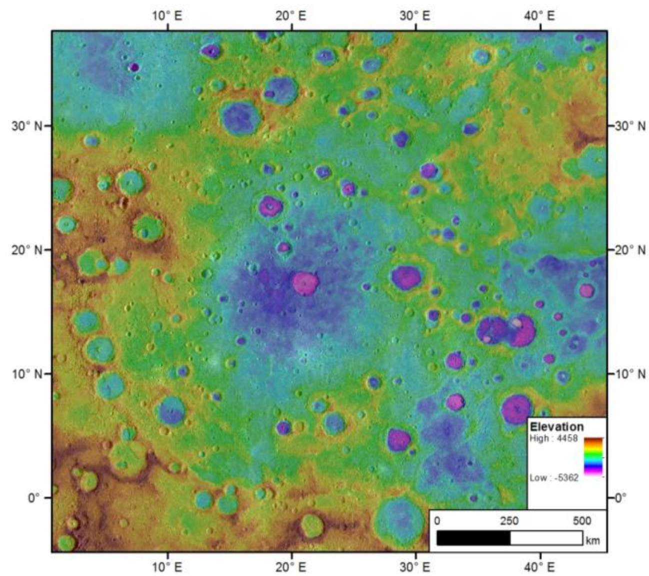

Figure 2 *– B30 basin in colour-coded topography. The SE basin boundary is marked by a lobate scarp.*

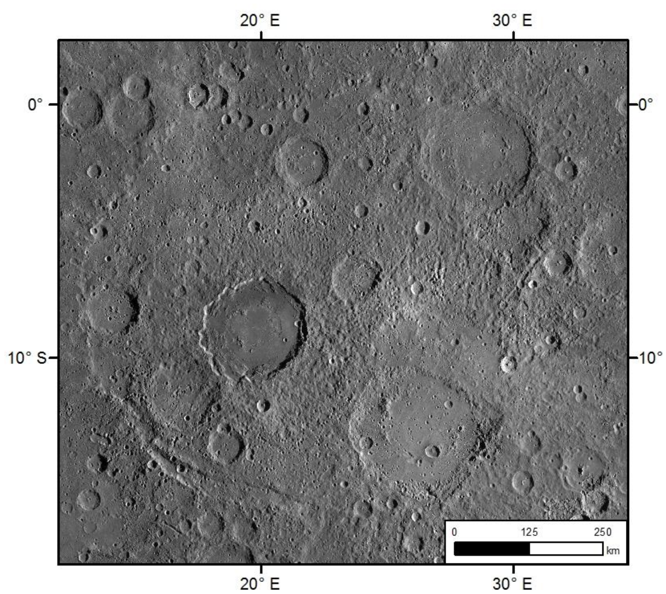

Figure 3 *– B36 basin. The 190 km Mansurian age crater in the centre-left of the image is Derain.*

tailed stratigraphic relationships. Candidate radial troughs were identified by [9]. Unlike some ancient basins on Mercury, such as Tolstoj, there is no evidence of subsequent volcanic resurfacing.

In the centre of B36 is the large Mansurian crater Derain. This contains extensive red pits, which have partially coalesced into a larger pit. Hollows are present on the crater floor [10]. This is the only set of hollows identified in B36. As hollows are thought to be formed by volatile loss [10,11], it is likely that a volatile phase underlies Derain. This material may not be present elsewhere in B36, or Derain may be unique in having currently visible hollow forming processes.

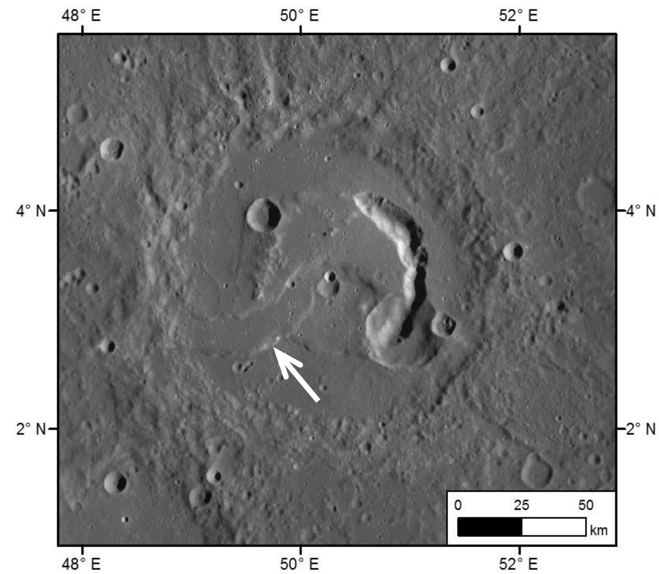

Figure 4 *– Picasso crater. The actuate pit chain is to the east of the crater. One of the curvilinear scarps is marked by the white arrow.*

Derain has also excavated a large amount of low reflectance material, principally towards the north and west.

Picasso Crater: Picasso is an unusual 120 km diameter crater centred at 50.21° E, 3.44° N. Its crater degradation state indicates a Tolstojan age, but it has an apparently younger plains unit occupying its floor.

It contains a set of arcuate red pits, which appears to be located around the trace of the mostly buried peak ring. Enhanced colour images show more intense red colour at the northern end of the chain. This may suggest that the pits were active sequentially, from south to north. It also contains quasi-radial, curvilinear, features that appear to mark small steps in the topography. The steps seem to match a regional break in slope, marked by a degraded lobate scarp. This in part leads to highly unusual topography within the crater as well as possibly showing unusual localisation of strain.

Future Work: We plan to complete crater mapping shortly and soon will have a preliminary stratigraphy to integrate into the global map [6]. We intend to perform in depth studies of Picasso crater, its landforms, and the area surrounding it.

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